

## REMARKS

This is intended as a full and complete response to the Office Action dated August 6, 2003, having a shortened statutory period for response set to expire on November 6, 2003. Claims 1 - 26 are pending in the application and stand rejected. In this response, claims 1-5, 14, and 24 have been canceled without prejudice, claims 6, 11, and 26 have been amended, and new claims 27-30 have been added. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-5, 11-14, 17, and 19-23 stand rejected under 35 USC § 102(a) over WO98/54377 (*Chiang et al.*). Claims 1-5, 11-14, 17, and 19-23 stand rejected under 35 USC § 103(a) over WO98/54377 (*Chiang et al.*). Claim 15 stands rejected under 35 USC § 103(a) over WO98/54377 (*Chiang et al.*) as applied to claims 1-5, 11-14, and 17-23 above, and further in view of U.S. Patent No. 5,354,712 (*Ho et al.*) and EP 0 867 525 (*Ngan et al.*). In this response, Applicants have canceled claims 1-5 and 14 and have amended claim 11 to include the limitations of claim 24. Applicants respectfully submit that the rejection has been obviated and respectfully request allowance of claim 11 and dependent claims 12-14, 17, and 19-23.

Claims 16 and 24-26 stand rejected under 35 USC § 103(a) over WO98/54377 (*Chiang et al.*) as applied to claims 1-5, 11-14, and 17-23 above, and further in view of U.S. Patent No. 5,972,179 (*Chittipeddi et al.*) on grounds that it would have been obvious to have utilized a multilayer stack and to have deposited the multilayer stack by first depositing by CVD and then PVD as taught by *Chittipeddi et al.* because it allows for controlling the surface morphology of the barrier layer. Applicants respectfully traverse this rejection.

It would not have been obvious to combine *Chiang et al.* and *Chittipeddi et al.* *Chittipeddi et al.* is directed to the deposition of a barrier layer for aluminum interconnects. (See, col. 4, ln. 30-46.) *Chiang et al.* is directed to the deposition of a barrier layer for copper interconnects. (See, pg. 10, ln. 8 to pg. 12, ln. 17.) *Chiang et al.* further discloses that one important function of barrier layers for copper interconnects is to prevent copper diffusion. (See, pg. 2, lns. 1-3.) It would not have been obvious to combine *Chiang et al.* and *Chittipeddi et al.* on grounds that references teach barrier

layers specific to different types of conductive interconnects and which are themselves different materials with different properties. As a consequence, Applicants respectfully request withdrawal of the rejection and allowance of the claims.

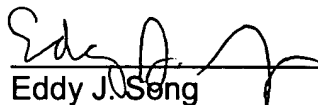
In addition, in regards to amended claim 26, the references, alone or in combination, do not teach, show, or suggest forming a first barrier layer using chemical vapor deposition and forming a second barrier layer comprising a material selected from the group including tantalum and tantalum nitride using physical vapor deposition. *Chiang et al.* discloses forming barrier layers by tuning the process variables during sputter deposition, *i.e.*, physical vapor deposition. (See, pg. 3, ln. 13 to pg. 5, ln. 15.) *Chittipeddi et al.* discloses forming a first titanium nitride barrier layer by chemical vapor deposition followed by a second titanium nitride layer by physical vapor deposition. (See, col. 2, ln. 59 to col. 3, ln. 15.) The combination of *Chiang et al.* and *Chittipeddi et al.* would not result in the invention as claimed. As a consequence, Applicants respectfully request withdrawal of the rejection and allowance of the claims.

Claims 6-10 stand rejected under 35 USC § 103(a) over No. 5,972,179 (*Chittipeddi et al.*) in view of EP 0 876 525 (*Ngan et al.*) on grounds that it would have been obvious to have modified *Chittipeddi et al.* by utilizing a high density PVD process such as IMP to produce the sputter deposited TiN film with low resistivity as taught by *Ngan et al.* because it allows for producing a film with lengthened performance lifetime. Applicants respectfully traverse this rejection.

*Chittipeddi et al.* discloses forming a first titanium nitride barrier layer by chemical vapor deposition followed by a second titanium nitride layer by physical vapor deposition. (See, col. 2, ln. 59 to col. 3, ln. 15.) *Ngan et al.* discloses depositing a titanium nitride film by sputtering techniques. (See, para. 49 to para. 76.) In regards to the claims as amended, the references, alone or in combination, do not teach, show, or suggest depositing a first barrier layer using chemical vapor deposition and depositing a second barrier layer using physical vapor deposition, wherein the second barrier layer comprises a material selected from the group including tantalum and tantalum nitride. As a consequence, Applicants respectfully request withdrawal of the rejection and allowance of the claims.

Having addressed all issues set out in the office action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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